MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

DCS5058 – OPERATING SYSTEMS

(DIT & DBIS)

1 JUNE 2016
2.30 p.m – 5.30 p.m
(3 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages with 2 sections.
2. Answer ALL questions.
3. Write your answers in the answer booklet provided.

Section A: Fill in the blanks (Total: 20 Marks)

Instruction: *Fill in the blanks with the terms given in the table.*

interrupt	starvation	microkernel	swapping	monitor
logical address	physical address	secondary	paging	indexed
preemptive	consumable	copy-on-write	file-server system	ready state
non-preemptive	process termination	layered approach	circular wait	blocked state
loosely coupled system	tightly coupled system	main memory management	memory-mapped files	dispatch latency

1. In _____, each processor has its own local memory in which processors communicate with one another through various communication lines.

2. _____ provide a file-system interface where clients can create, update, read and delete files.

3. Device controller informs CPU that it has finished its operation by causing a/an _____.

4. Privileged instructions can be issued only in _____ mode.

5. _____ contains only essential core operating systems.

6. _____ decides which processes and data to move into and out of memory.

7. _____ occurs when a process is completed and received an indication to stop the job due to an error or fault occurred in the operation.

8. In a Five-State-Model, a process in a _____ happens when the process cannot be executed until a specified event such as an I/O completion occurs.

9. Time difference between the process getting scheduled and process getting executed is called _____.

10. A scheduling discipline is _____ if once a process has been given the CPU, the CPU cannot be taken away from that process.

11. A deadlock situation can arise if four conditions hold simultaneously in a system, which are mutual exclusion, hold and wait, no preemption and _____.

Continued.....

12. In a deadlock, the form of _____ occurs when two or more threads are waiting on a condition that cannot be satisfied.

13. The types of _____ resources in a deadlock are Interrupts, signals, messages, and information in I/O buffers.

14. _____ is a simple memory management technique used by operating system to increase the utilisation of the processor by moving some blocked process from the main memory to secondary memory.

15. A translation of _____ must be mapped to a physical address before the memory access can be achieved.

16. _____ is a process to partition the memory into small equal fixed-size chunks and divide each process into the same size chunks.

17. _____ allows both parent and child processes to initially share the same pages in memory.

18. _____ allows file I/O to be treated as routine memory access by mapping a disk block to a page in memory.

19. File is a collection of related information which is stored in _____ storage.

20. _____ access method uses pointer to locate to various blocks in the memory.

Section B: Structured Questions, 4 Questions (Total: 80 Marks)

QUESTION 1 **[20 Marks]**

a. Serial processing is the first generation in evolution of operating system. What are the **TWO (2)** major problems of serial processing? (3 Marks)

b. Real time system is often used as a control device in a dedicated application.

   i. What are the **TWO (2)** categories of real time system? (1 Mark)

   ii. Briefly differentiate between these two categories. (4 Marks)

Continued.....

c. Refer to Figure 1, answer the following questions:

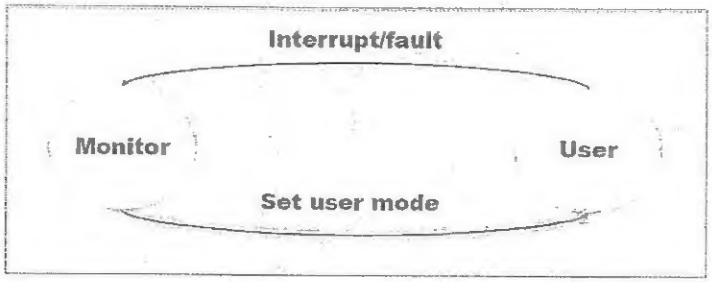


Figure 1

i. Explain the *monitor mode* and *user mode* in dual mode operation. (2 Marks)

ii. How does a computer system distinguish between user mode and monitor mode? (2 Marks)

iii. Do you think that dual mode operation is important in computer system? Provide your justification to support your answer. (3 Marks)

d. Briefly explain a *layered approach* operating system. (3 Marks)

e. Give **ONE (1)** advantage and **ONE (1)** disadvantage of layered approach operating system. (2 Marks)

QUESTION 2 **[32 Marks]**

a. A process control block is a collection of attributes of a process that are used by operating system for process control. Give **THREE (3)** characteristics of *process control block.* (3 Marks)

b. Give a brief explanation of *long-term*, *medium-term* and *short-term* scheduling. Which type of processor scheduling executes most frequently? (7 Marks)

Continued.....

c. Based on Table 1, draw a Gantt chart for Round Robin scheduling algorithm, assuming that the quantum is 6. Calculate the waiting time for each of the processes and also the average waiting time. (8 Marks)

Table 1

Process	Arrival Time *(ms)*	Burst Time *(ms)*	Priority
P1	0	16	4
P2	5	13	2
P3	10	2	1
P4	14	6	3
P5	5	10	1

d. Deadlock avoidance and deadlock prevention are two methods in handling deadlock. Give another **TWO (2)** methods other than deadlock avoidance and deadlock prevention in deadlock handling. (2 Marks)

e. Consider a system with four processes **N1, N2, N3** and **N4** and three resources; *printer*, *disk drive* and *scanner*. Table 2 shows the maximum requirements and the current allocation for each resource.

Table 2

	Printer		Disk Drive		Scanner	
	Max	Allocation	Max	Allocation	Max	Allocation
N1	3	2	3	2	7	3
N2	4	1	8	4	2	0
N3	8	7	17	3	9	1
N4	2	2	5	4	7	6

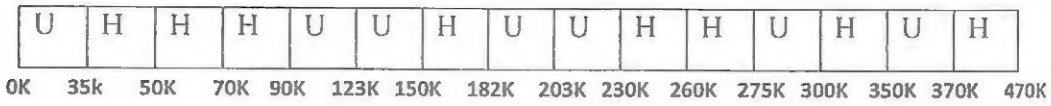
i. Calculate the total instances for each resource given that the availability for *printer*, *disk drive* and *scanner* are 4, 3 and 2 respectively. (1.5 Marks)

ii. Determine whether the system is in a safe state. Justify your answer. *(Hints: If it is in a safe state, give a safe order of execution using Banker's algorithm. If it is not a safe state, explain why it is not)* (10.5 Marks)

Continued.....

QUESTION 3 [28 Marks]

a. Given a heap of memory management scheme with the following free list:



* U - Used
* H - Hole

The following process request will be received in order as in Table 3:

Table 3

Process Number	Size in Kilobytes
1	30
2	59
3	9
4	13
5	46

Show how the memory requests above are allocated using the following memory allocation schemes.

i. Best Fit (BF) (4 Marks)

ii. First Fit (FF) (4 Marks)

b. Consider the following page reference string:

e, g, f, h, g, f, f, a, e, g, g, f, e, g, a, h

Assuming a paging scheme with **THREE (3)** frames is initially empty. Trace the allocation of pages to frames and determine the number of *page faults* occur using the following page replacement algorithms:

i. First In First Out (FIFO) (5 Marks)

ii. Least Recently Used (LRU) (5 Marks)

c. File is an abstract data type based on what it can do and operate. List out **THREE (3)** file operations. (3 Marks)

Continued.....

d. Differentiate between *sequential access method* and *direct access method* in file system. (4 Marks)

e. Give **ONE (1)** advantage and **TWO (2)** disadvantages of *single level directory*. (3 Marks)

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